

REMARKS/ARGUMENTS

Claims 9-13 are pending in this application.

Claims 10, 11, and 13 have been withdrawn from further consideration as being directed to a non-elected species. The Applicant respectfully requests that the Examiner rejoin and allow claims 10, 11, and 13 when generic claims 9 and 12 are allowed.

Claims 11 and 13 were rejected under 35 U.S.C. § 112, second paragraph as allegedly being indefinite. Particularly, the Examiner alleged that, "The claim limitations of 'at least one medium defining each of the lattice points includes at least two media', as recited in claim(s) 11 & 13 and the claim limitations of 'base medium', as recited in claim(s) 9 & 12, are unclear as to what the Applicant claims. The claim limitations mean that there are at least 3 media. However, from the Applicant's FIG. 1 (the elected embodiment) and FIG. 25 (Prior Art shows the entire device) it is unclear what are the three media to which the Applicant refers. Only two elements can be seen (FIG. 1; 12 & 21). Therefore, the claims are cited as indefinite."

Applicant respectfully submits that Fig. 24 depicts three media having mutually distinct refractive indices. For example, the base medium has a first refractive index n_1 , and each of the lattice points are made from a medium having different refractive indexes of n_2 and n_3 , respectively. However, because Fig. 24 is drawn to a non-elected species, Applicant has withdrawn claims 11 and 13 from further consideration. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 11 and 13 under 35 U.S.C. § 112, second paragraph.

Claims 9 and 11-13 were rejected under 35 U.S.C. § 102(b) as being anticipated by Cunningham et al. (U.S. 2002/0127565). Claims 9 and 11-13 were rejected under 35 U.S.C. § 102(b) as being anticipated by Deng et al. (U.S. 2003/0235229).

Applicant respectfully traverses the prior art rejections of claims 9 and 12. Claims 11 and 13 have been withdrawn from further consideration.

Claim 9 recites:

A two-dimensional photonic crystal surface-emitting laser comprising:

a photonic crystal which has a photonic crystal periodic structure located in or near an active layer which emits light when carriers are injected thereto, said photonic crystal periodic structure including a base medium and at least one medium defining lattice points, the base medium and the at least one medium having different refractive indices in a two-dimensional periodic array; wherein

said photonic crystal period structure is a substantially square lattice structure or a substantially rectangular lattice structure; and

said photonic crystal period structure is classified into pg by a classification method under IUC (International Union Crystallography in 1952). (emphasis added)

The Examiner alleged that both of Cunningham et al. and Deng et al. teaches each and every element recited in claim 9. Particularly, with respect to each of Cunningham et al. and Deng et al., the Examiner alleged, "said photonic crystal period structure is classified into pl, pm, pg or cm by a classification method under IUC (International Union of Crystallography in 1952) (inherently a 'pl, pm, pg or cm' lattice structure by Applicant's admission; on pages 17 & 18 of the specification Applicant admits that the lattice structure of the type described by Cunningham in FIG. 3A [and by Deng et al. in FIGS. 1A and 1B], with the triangles instead of squares is a pl, pm, pg or cm lattice structure)."Applicant respectfully disagrees.

Cunningham et al. is directed to a biosensor that is capable of detecting a binding of one or more specific binding substances to their binding partners, as described in paragraph [0008] of Cunningham et al. This biosensor is defined by an optical device that is illuminated by incident light that is supplied from outside of the sensor, as discussed in paragraphs [0007]-[0011] and depicted in Fig. 1A of Cunningham et al.

In contrast to the Examiner's allegations, the biosensor of Cunningham is merely a receptor for receiving outside light, and possesses no light producing capabilities of its own. Accordingly, Cunningham et al. fails to teach or suggest "an active layer that emits light when carriers are injected thereto" as is recited in claim 9. Thus, Cunningham et al. does not anticipate each and every one of the features recited in Applicant's claim 9.

Deng et al. is directed to a vertical cavity light emitting laser that uses photonic crystals 310, 312 that are sandwiched between a pair of Distributed Bragg Reflector (DBR) layers 304,

314, as shown in Figs. 3 and 4 of Deng et al. These photonic crystals include cavities 102, 104 formed therein as is shown in Fig. 1A of Deng et al. However, contrary to the Examiner's allegation, these cavities are not arranged in a manner such that they can be classified into a IUC pg classification. As is discussed in table 1 on page 18 of Applicant's originally filed specification (reproduced below) and shown in Applicant's Figs. 15-21, these categories are not defined merely by a shape of the lattice points. These categories also require that the lattice points are positioned in a specific arrangement such that they have specific reflection characteristics. It is a combination of the shape of the lattice points, along with their positioning with respect to one another that defines whether a photonic crystal period structure fits within a specific IUC classification. Deng et al. does not include any teaching or suggestion that the cavities 102, 104 need to be arranged in a specific arrangement to achieve a pg classification. Accordingly, Deng et al. fails to teach or suggest "said photonic crystal period structure is classified into pg by a classification method under IUC (International Union Crystallography in 1952)" as is recited in claim 9. Thus, Deng et al. does not anticipate each and every one of the features recited in Applicant's claim 9.

Table 1

ICU Marks	Conditions	Possible Lattice Structure
pl	not including reflection and shear reflection	oblique lattice, rectangular lattice, face-centered lattice, square lattice, hexagonal lattice
pm	including reflection The axis of shear reflection is also the axis of reflection.	rectangular lattice, square lattice
pg	not including reflection and including shear reflection	rectangular lattice, square lattice
cm	including reflection There is an axis of shear reflection which is not an axis of reflection.	face-centered lattice, square lattice, hexagonal lattice

The Examiner is reminded that a "claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Accordingly, Applicant respectfully submits that neither Cunningham et al. nor Deng et al. teach or suggest the unique combination of features recited in claim 9 of the present application.

Claim 12 recites:

A two-dimensional photonic crystal surface-emitting laser comprising:
a photonic crystal which has a photonic crystal periodic structure located in or near an active layer which emits light when carriers are injected thereto, said photonic crystal periodic structure including a base medium and at least one medium defining lattice points, the base medium and the at least one medium having different refractive indices in a two-dimensional periodic array; wherein
said photonic crystal period structure is a substantially square lattice structure or a substantially rectangular lattice structure;
the lattice points are substantially triangular lattice points; and
said photonic crystal period structure is classified into pm, cm, or pl by a classification method under IUC (International Union Crystallography in 1952).
(emphasis added)

The Examiner alleged that both of Cunningham et al. and Deng et al. teach each and every element recited in claim 12. Particularly, with respect to each of Cunningham et al. and Deng et al., the Examiner alleged, "said photonic crystal period structure is classified into pl, pm, pg or cm by a classification method under IUC (International Union of Crystallography in 1952) (inherently a 'pl, pm, pg or cm' lattice structure by Applicant's admission; on pages 17 & 18 of the specification Applicant admits that the lattice structure of the type described by Cunningham in FIG. 3A [and by Deng et al. in FIGS. 1A and 1B], with the triangles instead of squares is a pl, pm, pg or cm lattice structure)." Applicant respectfully disagrees.

As discussed above, Cunningham is merely a receptor for receiving outside light, and possesses no light producing capabilities of its own. Accordingly, Cunningham et al. fails to teach or suggest "an active layer that emits light when carriers are injected thereto" as is recited in claim 12. Thus, Cunningham et al. does not anticipate each and every one of the features recited in Applicant's claim 12.

As discussed above, Deng et al. teaches that photonic crystals include cavities 102, 103

formed therein as is shown in Fig. 1A of Deng et al. However, contrary to the Examiner's allegation, these cavities are not arranged in a manner such that they can be classified into an IUC pm, cm, or pl classification. As is discussed in table 1 on page 18 of Applicant's specification (reproduced above) and shown in Applicant's Figs. 15-21, these categories are not defined merely by a shape of the lattice points. These categories also require that the lattice points are positioned in a specific arrangement such that they have specific reflection characteristics. It is a combination of the shape of the lattice points, along with their positioning with respect to one another that defines whether a photonic crystal period structure fits within a specific IUC classification. Deng et al. does not include any teaching or suggestion that the cavities 102, 103 need to be arranged to achieve a pm, cm, or pl classification. Accordingly, Deng et al. fails to teach or suggest "said photonic crystal period structure is classified into pm, cm, or pl by a classification method under IUC (International Union Crystallography in 1952)" as is recited in claim 12. Thus, Deng et al. does not anticipate each and every one of the features recited in Applicant's claim 12.

The Examiner is reminded that a "claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Accordingly, Applicant respectfully submits that neither Cunningham et al. nor Deng et al. teach or suggest the unique combination of features recited in claim 12 of the present application.

In view of the foregoing remarks, Applicant respectfully submits that claims 9 and 12 are allowable.

Applicant also respectfully requests that the Examiner rejoin and allow non-elected claims 10, 11, and 13 which depend upon claims 9 and 12, and are therefore allowable for the reasons that claims 9 and 12 are allowable.

In view of the foregoing remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

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Reply to the Office Action dated November 5, 2008
Page 9 of 9

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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